

CLAIMS

1. A method for catalytic reduction of nitrogen oxides contained in exhaust gases wherein fuel is supplied and subjected to combustion under periodic rich/lean conditions and the resulting exhaust gases are brought into contact with a catalyst, which catalyst comprises:
- (A) a catalyst component A which comprises
- (c) ceria or
- (d) praseodymium oxide or
- (e) an oxide and/or a composite oxide of at least two elements selected from the group consisting of cerium, zirconium, praseodymium, neodymium, terbium, samarium, gadolinium and lanthanum;
- (B) a catalyst component B which comprises
- (d) a noble metal catalyst component selected from the group consisting of platinum, rhodium, palladium and oxides thereof and
- (e) a carrier; and
- (C) a catalyst component C which comprises
- (f) a solid acid, and
- (g) a solid acid supporting an oxide of at least one element selected from the group consisting of vanadium, tungsten, molybdenum, copper, iron, cobalt, nickel and manganese.
2. A method for catalytic reduction of nitrogen oxides contained in exhaust gases wherein fuel is supplied and subjected to combustion under periodic rich/lean conditions and the resulting exhaust gases are brought into contact with a catalyst, which catalyst comprises:
- an outer catalyst layer comprising a catalyst component A and a catalyst component C, as an outer catalyst component, wherein the catalyst component A comprises
- (A) (a) ceria or
- (b) praseodymium oxide or
- (c) an oxide and/or a composite oxide of at least two elements

selected from the group consisting of cerium, zirconium, praseodymium, neodymium, terbium, samarium, gadolinium and lanthanum; and

the catalyst component C comprises

5 (C) (f) a solid acid, and

(g) a solid acid supporting an oxide of at least one element selected from the group consisting of vanadium, tungsten, molybdenum, copper, iron, cobalt, nickel and manganese; and

an inner catalyst layer comprising a catalyst component B, as
10 an inner catalyst component, wherein the catalyst component B comprises

(B) (d) a noble metal catalyst component selected from the group consisting of platinum, rhodium, palladium and oxides thereof and
(e) a carrier.

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3. A method as claimed in claim 1 or 2 wherein the catalyst component A supports thereon at least one noble metal catalyst component selected from the group consisting of platinum, rhodium, palladium and oxides thereof.

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4. A method for catalytic reduction of nitrogen oxides contained in exhaust gases wherein fuel is supplied and subjected to combustion under periodic rich/lean conditions and the resulting exhaust gases are brought into contact with a catalyst, which
25 catalyst comprises:

an outer catalyst layer comprising a catalyst component A and a catalyst component C, as an outer catalyst component, wherein the catalyst component A comprises

(A) (a) ceria or

30 (b) praseodymium oxide or

(c) an oxide and/or a composite oxide of at least two elements selected from the group consisting of cerium, zirconium, praseodymium, neodymium, terbium, samarium, gadolinium and lanthanum; and

35 the catalyst component C comprises

(C) (f) a solid acid, and

(g) a solid acid supporting an oxide of at least one element selected from the group consisting of vanadium, tungsten, molybdenum, copper, iron, cobalt, nickel and manganese; and

5 an inner catalyst layer comprising a catalyst component A and a catalyst component C, as an inner catalyst component, wherein the catalyst component A comprises

(A) (a) ceria or

(b) praseodymium oxide or

10 (c) an oxide and/or a composite oxide of at least two elements selected from the group consisting of cerium, zirconium, praseodymium, neodymium, terbium, samarium, gadolinium and lanthanum; and

the catalyst component B comprises

15 (B) (d) a noble metal catalyst component selected from the group consisting of platinum, rhodium, palladium and oxides thereof and (e) a carrier.

20 5. A method as claimed in claim 4 wherein at least one of the catalyst component A in the outer catalyst component and the catalyst component A in the inner catalyst component supports thereon at least one noble metal catalyst component selected from the group consisting of platinum, rhodium, palladium and oxides thereof.

25 6. A method for catalytic reduction of nitrogen oxides contained in exhaust gases wherein fuel is supplied and subjected to combustion under periodic rich/lean conditions and the resulting exhaust gases are brought into contact with a catalyst structure, in which the catalyst structure comprises an inactive substrate and the
30 catalyst as claimed in any one of claims 1 to 5.

35 7. A catalyst for catalytic reduction of nitrogen oxides contained in exhaust gases wherein fuel is supplied and subjected to combustion under periodic rich/lean conditions and the resulting exhaust gases are brought into contact therewith, which catalyst

comprises:

(A) a catalyst component A comprising

(c) ceria or

(d) praseodymium oxide or

5 (e) an oxide and/or a composite oxide of at least two elements selected from the group consisting of cerium, zirconium, praseodymium, neodymium, terbium, samarium, gadolinium and lanthanum;

(B) a catalyst component B comprising

10 (d) a noble metal catalyst component selected from the group consisting of platinum, rhodium, palladium and oxides thereof and

(e) a carrier; and

(C) a catalyst component C comprising

(f) a solid acid, and

15 (g) a solid acid supporting an oxide of at least one element selected from the group consisting of vanadium, tungsten, molybdenum, copper, iron, cobalt, nickel and manganese.

20 8. A catalyst for catalytic reduction of nitrogen oxides contained in exhaust gases wherein fuel is supplied and subjected to combustion under periodic rich/lean conditions and the resulting exhaust gases are brought into contact therewith, which catalyst comprises:

25 an outer catalyst layer comprising a catalyst component A and a catalyst component C, as an outer catalyst component, wherein the catalyst component A comprises

(A) (a) ceria or

(b) praseodymium oxide or

30 (c) an oxide and/or a composite oxide of at least two elements selected from the group consisting of cerium, zirconium, praseodymium, neodymium, terbium, samarium, gadolinium and lanthanum; and

the catalyst component C comprises

(C) (f) a solid acid, and

35 (g) a solid acid supporting an oxide of at least one element

selected from the group consisting of vanadium, tungsten, molybdenum, copper, iron, cobalt, nickel and manganese; and

an inner catalyst layer comprising a catalyst component B, as an inner catalyst component, wherein the catalyst component B comprises

(B) (d) a noble metal catalyst component selected from the group consisting of platinum, rhodium, palladium and oxides thereof and (e) a carrier.

9. A catalyst as claimed in claim 7 or 8 wherein the catalyst component A supports thereon at least one noble metal catalyst component selected from the group consisting of platinum, rhodium, palladium and oxides thereof.

10. A catalyst for catalytic reduction of nitrogen oxides contained in exhaust gases wherein fuel is supplied and subjected to combustion under periodic rich/lean conditions and the resulting exhaust gases are brought into contact therewith, which catalyst comprises:

an outer catalyst layer comprising a catalyst component A and a catalyst component C, as an outer catalyst component, wherein the catalyst component A comprises

(A) (a) ceria or

(b) praseodymium oxide or

(c) an oxide and/or a composite oxide of at least two elements selected from the group consisting of cerium, zirconium, praseodymium, neodymium, terbium, samarium, gadolinium and lanthanum; and

the catalyst component C comprises

(C) (f) a solid acid, and

(g) a solid acid supporting an oxide of at least one element selected from the group consisting of vanadium, tungsten, molybdenum, copper, iron, cobalt, nickel and manganese; and

an inner catalyst layer comprising a catalyst component A and a catalyst component C, as an inner catalyst component, wherein the

catalyst component A comprises

(A) (a) ceria or

(b) praseodymium oxide or

(c) an oxide and/or a composite oxide of at least two elements
5 selected from the group consisting of cerium, zirconium,
praseodymium, neodymium, terbium, samarium, gadolinium and
lanthanum; and

the catalyst component B comprises

(B) (d) a noble metal catalyst component selected from the group
10 consisting of platinum, rhodium, palladium and oxides thereof and
(e) a carrier.

11. A catalyst as claimed in claim 10 wherein at least one of
the catalyst component A in the outer catalyst component and the
15 catalyst component A in the inner catalyst component supports
thereon at least one noble metal catalyst component selected from the
group consisting of platinum, rhodium, palladium and oxides thereof.

12. A catalyst structure for catalytic reduction of nitrogen
20 oxides contained in exhaust gases wherein fuel is supplied and
subjected to combustion under periodic rich/lean conditions and the
resulting exhaust gases are brought into contact therewith, in which
the catalyst structure comprises an inactive substrate and the
catalyst as claimed in any one of claims 7 to 11.

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